Whats new with MODIS NPP, GPP and ET

MODIS/VIIRS Science Team Meeting

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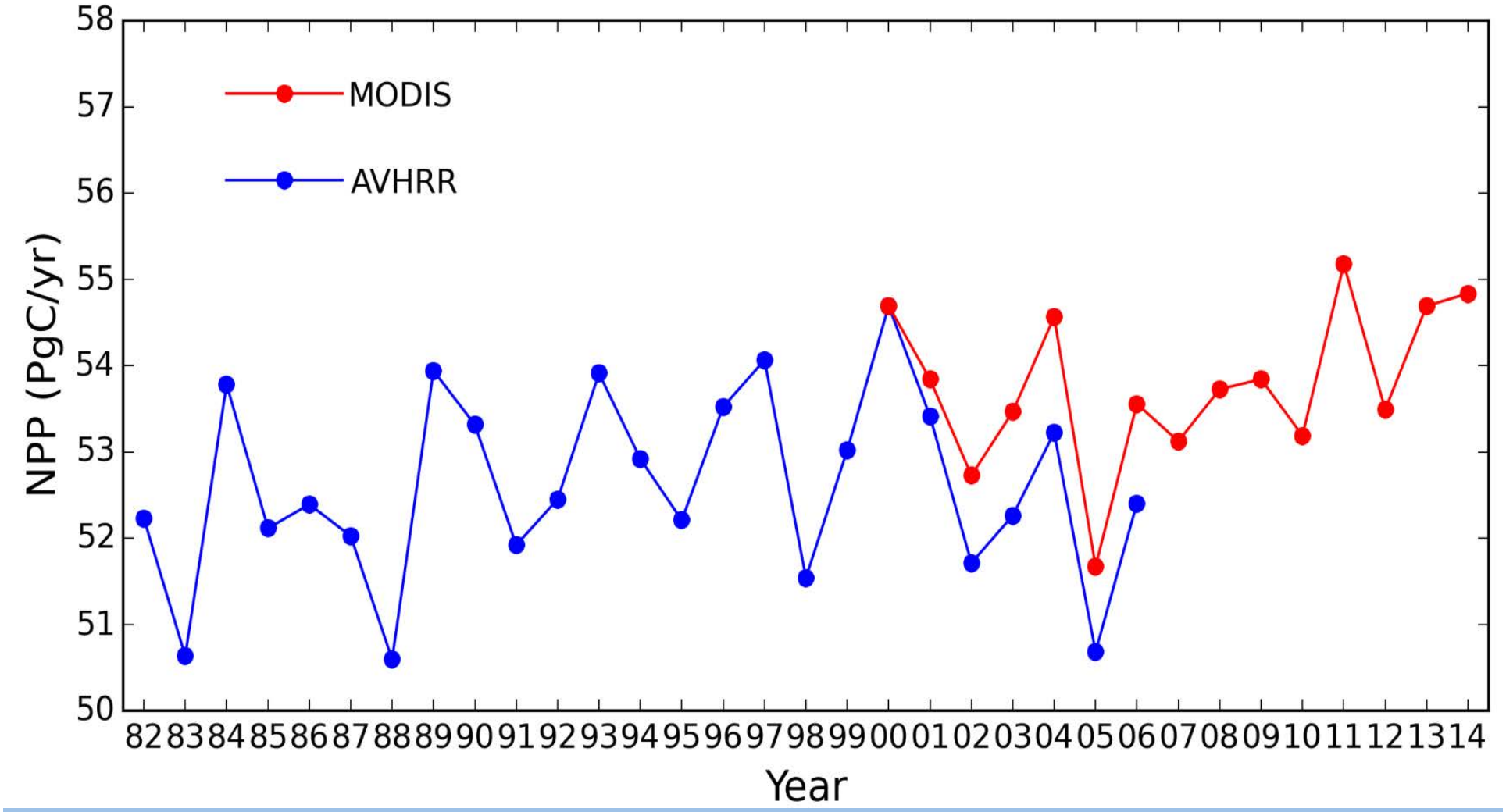
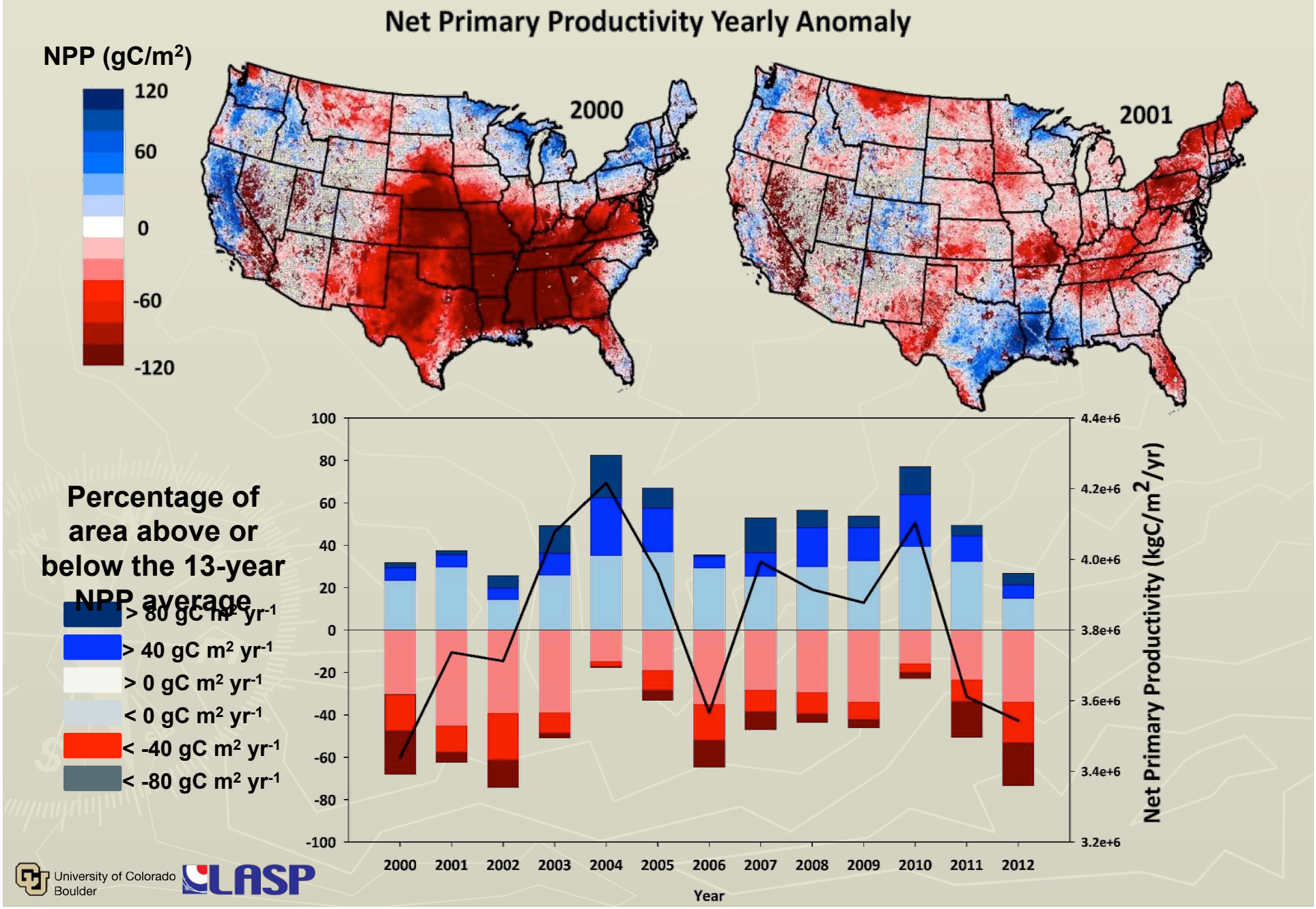
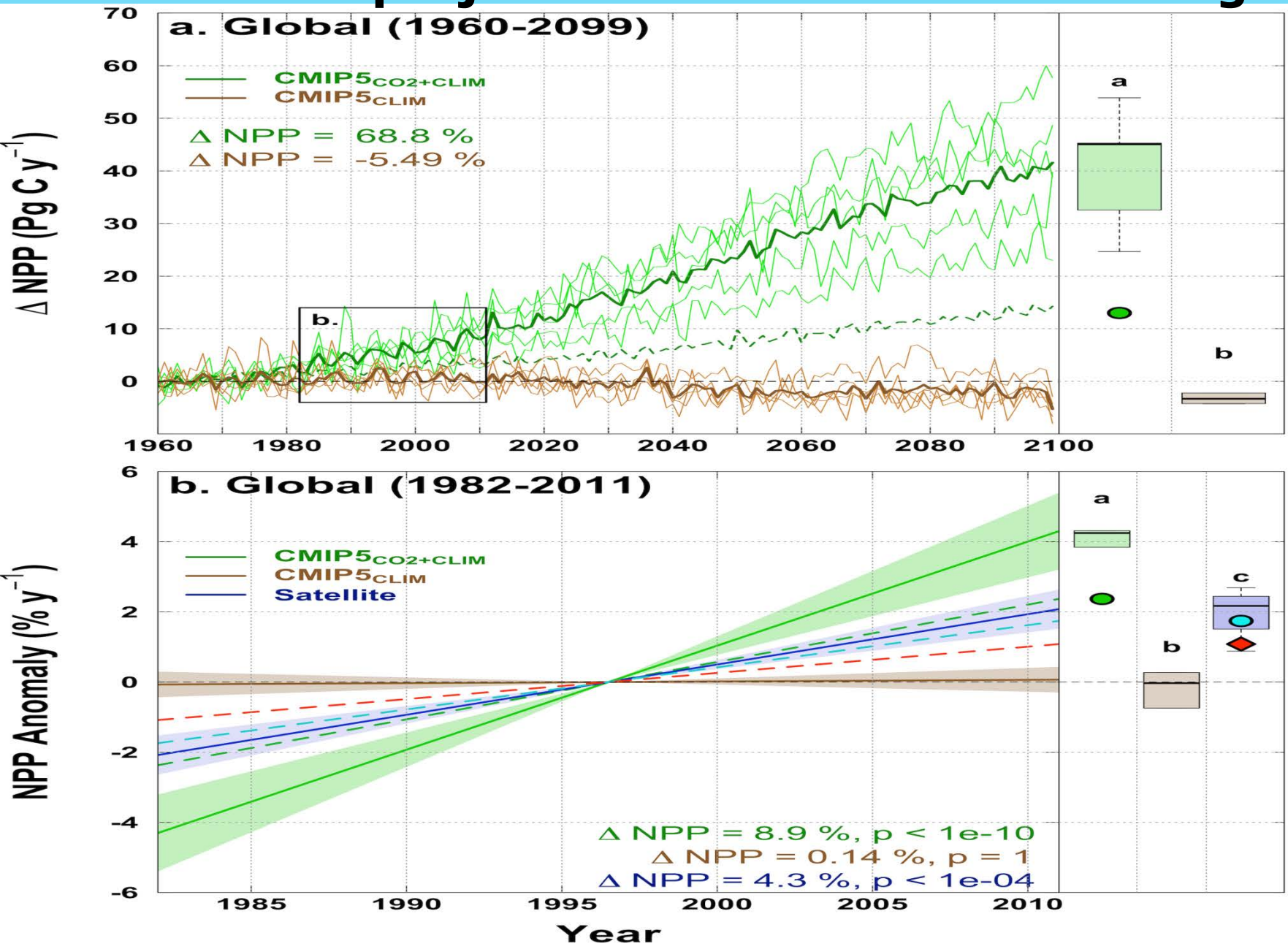
GLOBAL NPP TREND



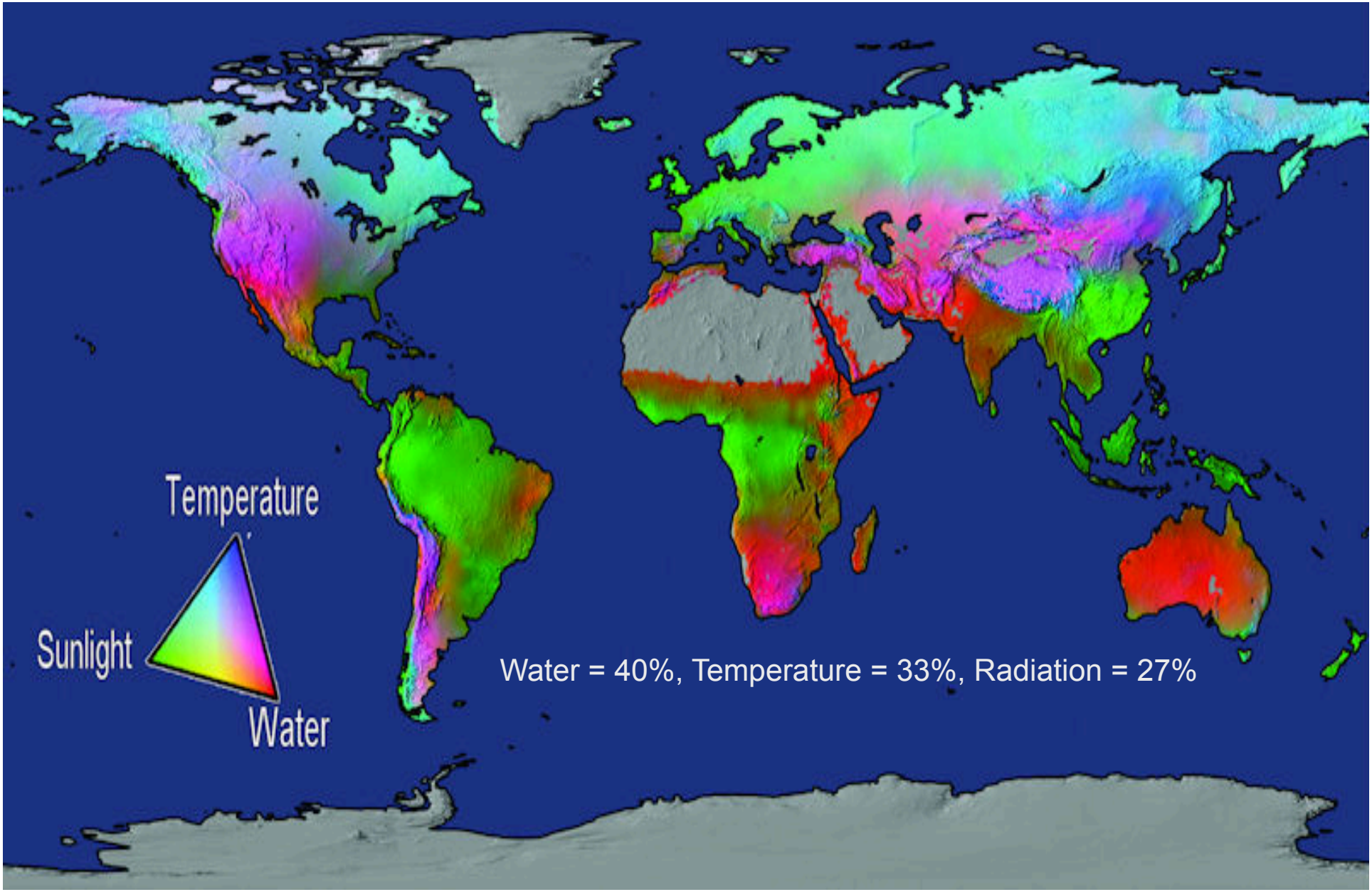
Net Primary Productivity Indicator



CMIP5 projections of NPP are too strong

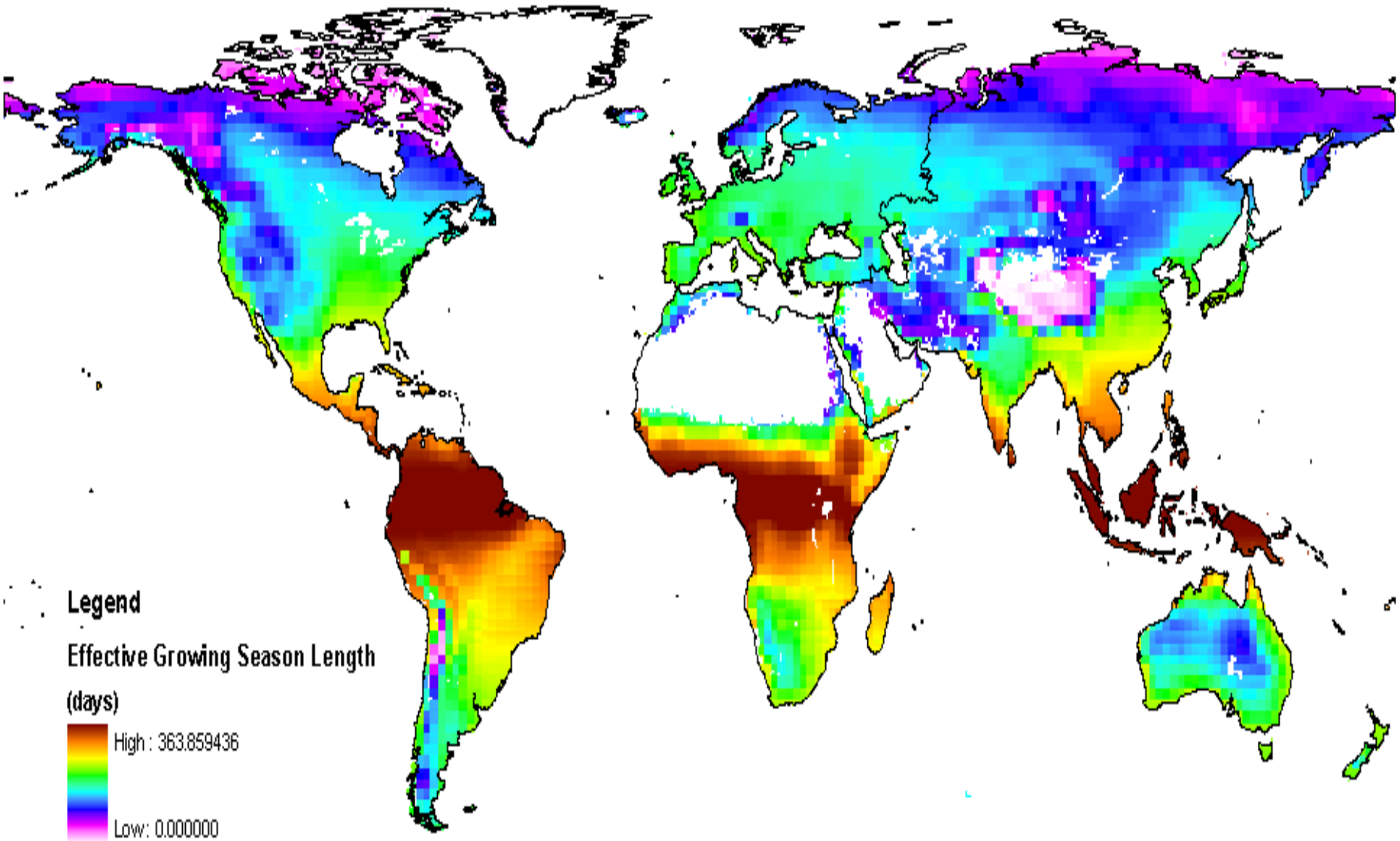


Smith et al 2016 Nature Climate Change, (6) p306-311



Potential limits to vegetation net primary production based on fundamental physiological limits by solar radiation, water balance, and temperature (from Churkina & Running, 1998; Nemani et al., 2003; Running et al., 2004).

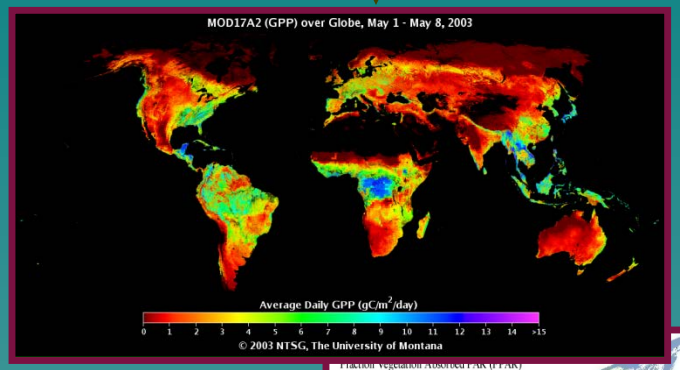
Global Effective Growing Season Length



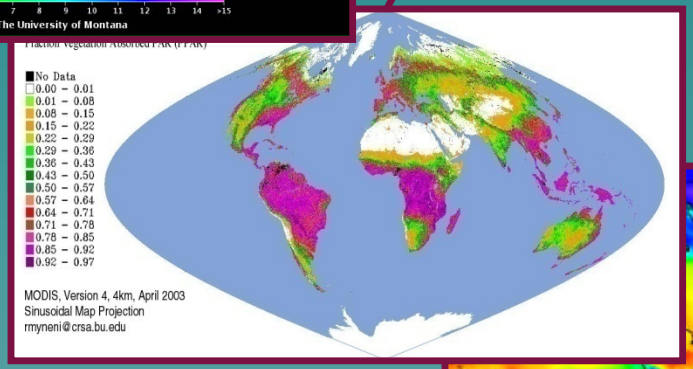
Jolly, Nemani, Running. Global Change Biology 2005

GPP = Light X Conversion Efficiency

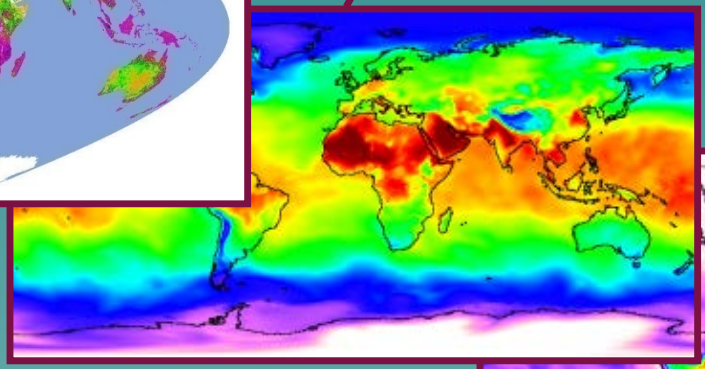
GPP = f (PAR) x ε



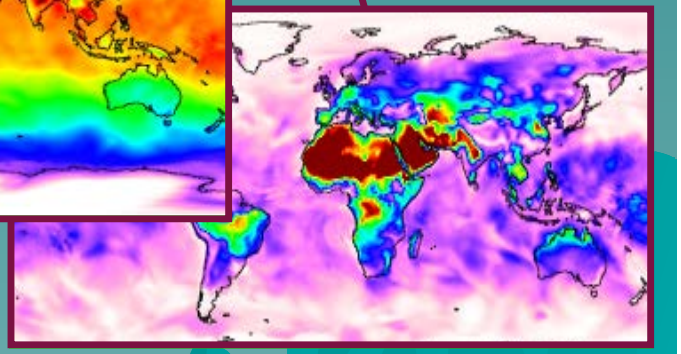
GPP



fPAR, PAR



Temperature

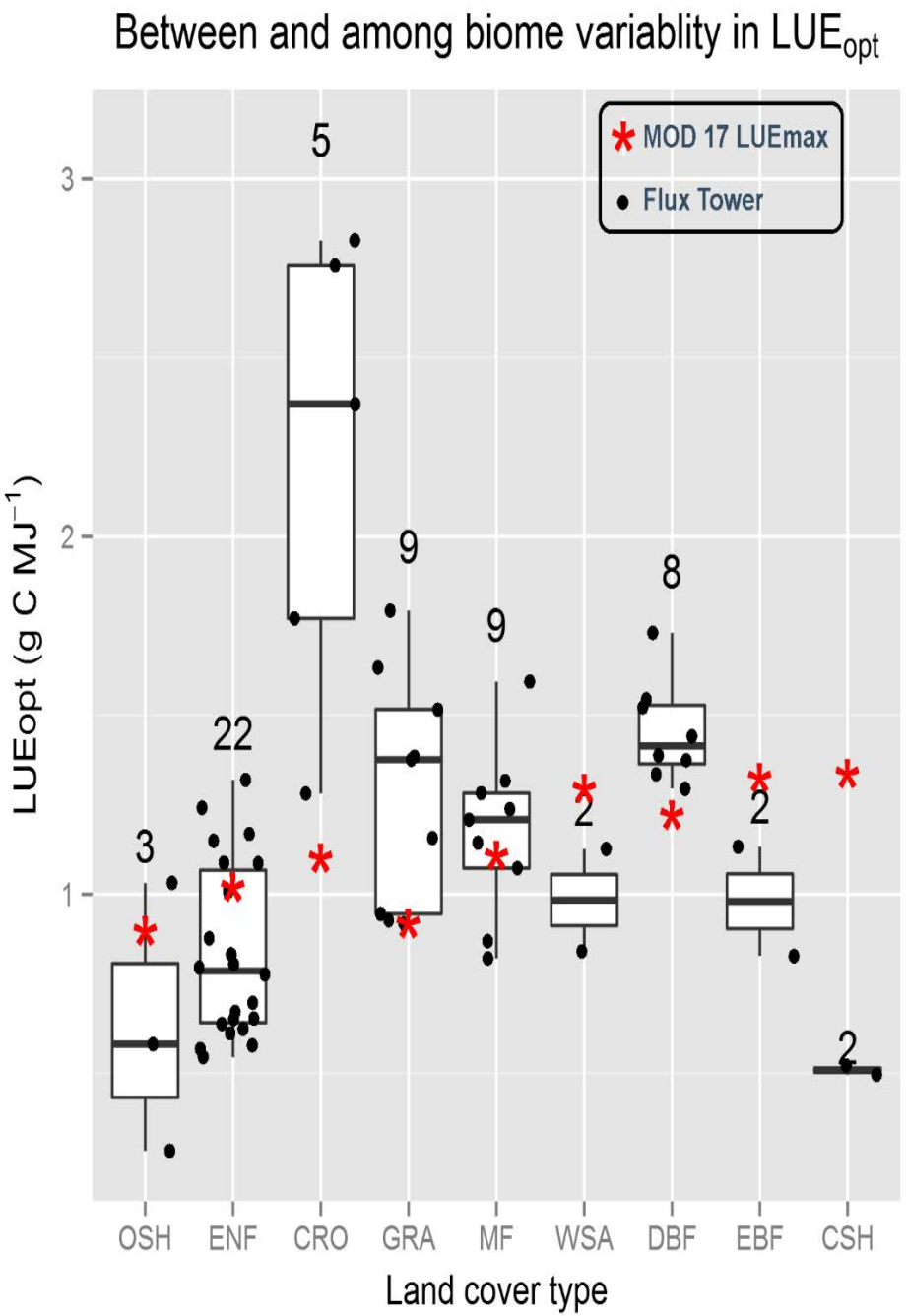


VPD

Biome Properties Look-Up Table (ε_{max})

Spatial variability in LUE_{opt}

- Croplands show largest LUE_{opt} variability.
- MOD17 LUE_{max} < LUE_{opt} for CRO, GRA, DBF
- MOD17 LUE_{max} > LUE_{opt} for CSH.
- Aggregating LUE_{opt} variability within coarse plant functional type (PFT) classes leads to large model LUE and GPP error.



Spatially explicit estimation of optimal light use efficiency for improved satellite data driven ecosystem productivity modeling. Nima Madani, John S. Kimball, Steve W. Running. AGU 2014

AGU PUBLICATIONS

JGR

Journal of Geophysical Research: Biogeosciences

RESEARCH ARTICLE
10.1002/2014JG002709

Key Points:
- Quantifying ecosystem optimal light use efficiency
- Optimum light use efficiency shows spatial variability within and among biome types
- Spatially explicit optimum light use efficiency dramatically improves remote sensing ecosystem productivity modeling

Improving ecosystem productivity modeling through spatially explicit estimation of optimal light use efficiency

Nima Madani[1,2], John S. Kimball[1,2], David L. R. Affleck[3], Jens Kattge[4], Jon Graham[5], Peter M. van Bodegom[6], Peter B. Reich[7,8], and Steven W. Running[2]

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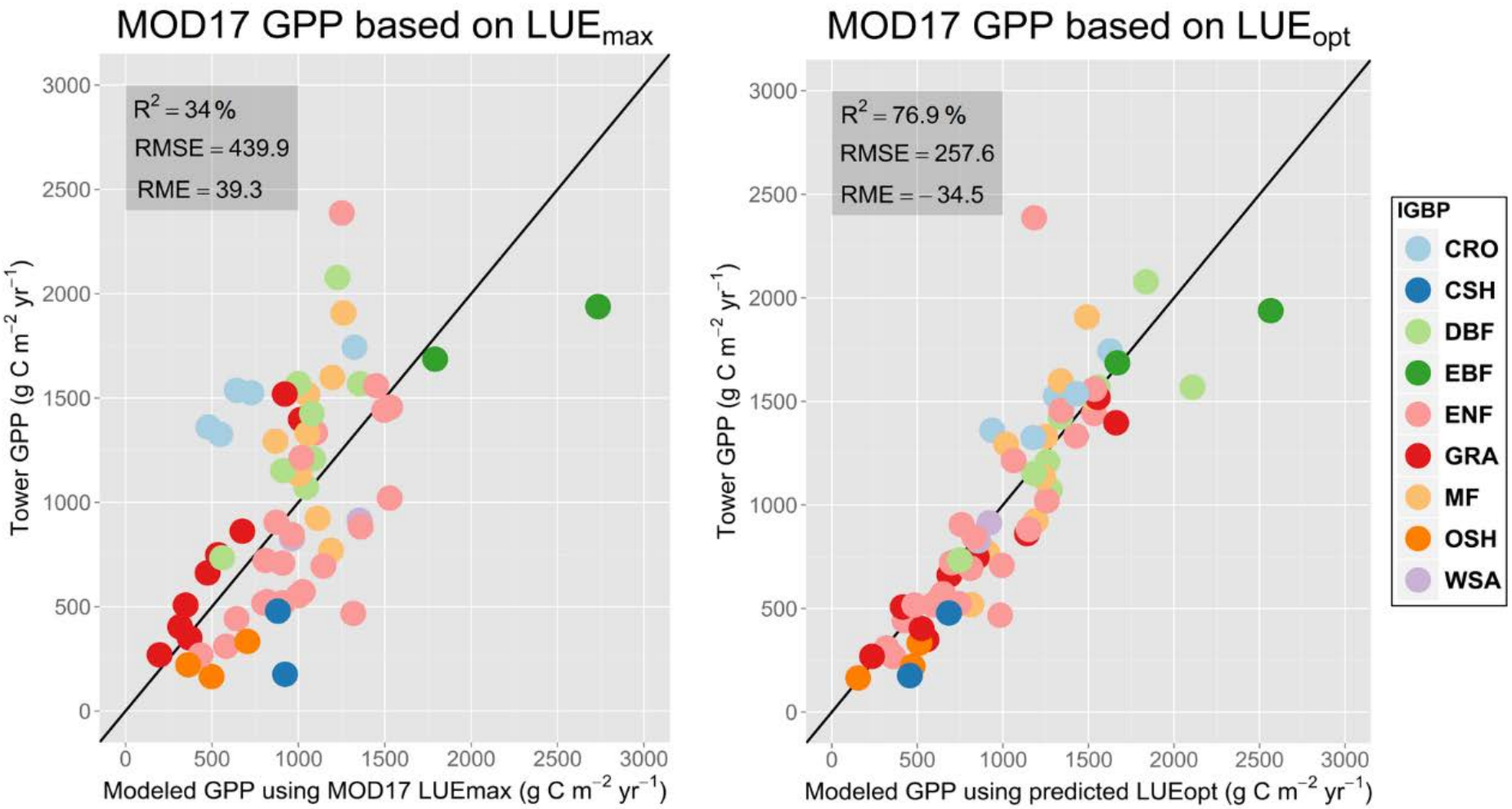

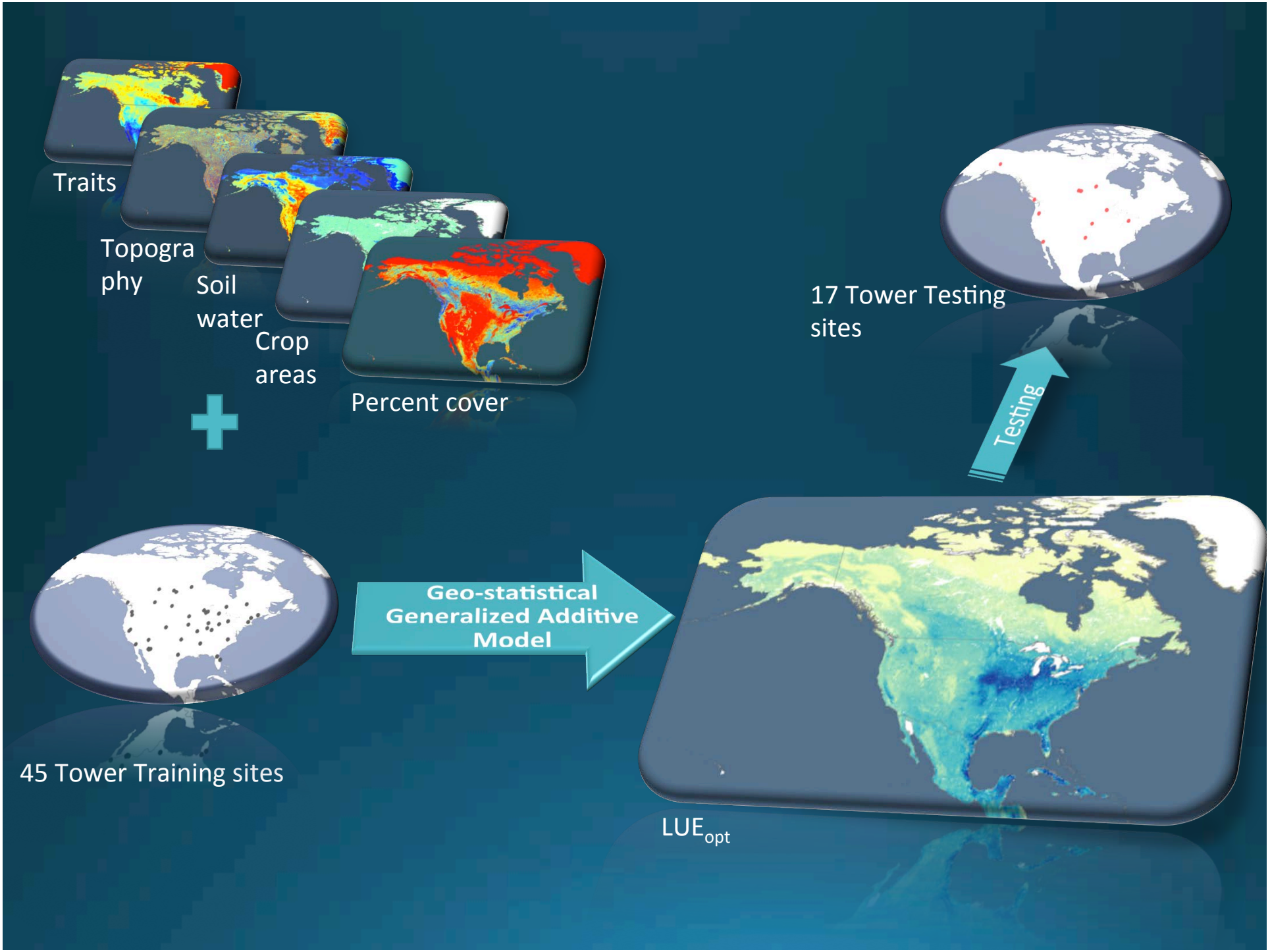
Traits
Topography
Soil water
Crop areas
Percent cover
17 Tower Testing sites
Testing
45 Tower Training sites
Geo-statistical Generalized Additive Model
LUE$_{opt}$

Global Annual 1-km ET over 2000-2010

Global average MODIS ET over vegetated land surface is 568.7 ± 358.2 mm yr^{-1}.